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### Estimating long-term exposures to air pollution in Scotland

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1331	<p><b>ESTIMATING LONG-TERM EXPOSURES TO AIR POLLUTION IN SCOTLAND</b></p> <p>C YAP<sup>1</sup>, C ROBERTSON<sup>2</sup>, I BEVERLAND<sup>2</sup>, DJ HOLE<sup>1</sup>, R AGIUS<sup>3</sup>, MR HEAL<sup>4</sup>, DEJ HENDERSON<sup>2</sup>, G COHEN<sup>5</sup>, G MORRIS<sup>6</sup></p> <p>(1) , UNIVERSITY OF GLASGOW, GLASGOW. (2) , UNIVERSITY OF STRATHCLYDE, GLASGOW. (3) , UNIVERSITY OF MANCHESTER, MANCHESTER. (4) , UNIVERSITY OF EDINBURGH, EDINBURGH. (5) , THE EMMES CORPORATION, MARYLAND. (6) , HEALTH PROTECTION SCOTLAND, GLASGOW.</p>
<p>Preferred presentation format: Poster</p> <p>Abstract category 1: 26 - Exposure Modelling.</p> <p>Abstract category 2: 29 - GIS, Exposure Analysis and Environmental Epidemiology.</p>	<p><b>Introduction:</b> One of the most challenging tasks for epidemiological studies on chronic health effects of air pollution is to reliably estimate subjects' long-term exposures. The objective of this paper was to investigate different methodologies to estimate long-term exposures to air pollution for subjects recruited in two large Scottish cohorts, whose residences were geographically dispersed across the central belt of Scotland. These methodologies for estimating exposures involved a combination of imputation and modeling techniques of both monitored data as well as local environmental predictors derived using Geographical Information System, GIS.</p> <p><b>Methods:</b> Detailed individual baseline risk factors, including the postcode of residence, among 22,000 Scottish participants were collected during 1970-1976. To obtain their long-term exposures to air pollutants, records of black smoke data from 182 monitoring sites were obtained from the UK National Air Quality Information Archive for the decade 1970-79. However, a substantial amount of data was missing in several sites. Missing daily observations at the black smoke monitoring sites were imputed using a log-linear regression model, taking into account day of the week and seasonal effects after grouping sites into regions.</p> <p>The first technique, a widely used approach, was to obtain inverse-squared distance weighted measures of the geometric mean estimates of the nearby monitoring sites to estimate long-term exposures for participants. The second proposed technique was based on multivariate spatial smoothing using Semiparametric Additive Model with useful local environmental predictors, LEP (which included altitude, household density within a 250m buffer, distance to nearest major road and distance to edge of urban boundaries). An alternative approach, Multilevel Spatio-Temporal modeling of monthly black smoke and LEP, was also developed. The latter model was capable of estimating coefficients of the LEP in the presence of missing data, and allowed for predictions of the missing values from the fitted model. Maps of predicted average participants' exposures using the three methodologies were produced and compared.</p> <p><b>Results:</b> The estimated long-term median exposure levels at the participants' residential addresses for the first two methods ranged from 5.4 to 70.0 • g/m<sup>3</sup> and 3.5 to 48.5 • g/m<sup>3</sup> respectively. Range of participants' exposures for the third method was 4.0 to 55.3 • g/m<sup>3</sup>.</p> <p><b>Discussion:</b> Results from the first method differed from the other two. The latter two approaches took into account useful air quality indicators to predict participants' exposure levels on a finer scale, which would arguably be better reflections of participants' exposures. This project is funded by the UK Department of Health.</p>